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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/776,427	02/02/2001	Ronald A. Zweifel	47159-00026	5305

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JENKENS & GILCHRIST, P.C.
225 WEST WASHINGTON
SUITE 2600
CHICAGO, IL 60606

EXAMINER

GORDON, BRIAN R

ART UNIT PAPER NUMBER

1743

DATE MAILED: 09/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Applicati n N .

09/776,427

Applicant(s)

ZWEIFEL ET AL.

Examiner

Brian R. Gordon

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 February 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-43 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-43 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2,3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

The information disclosure statement filed January 14, 2003 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each U.S. and foreign patent; each publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered.

No copy of EP 0 810 438 A2 was received and has therefore not been considered.

Claim Rejections - 35 USC § 112

1. Claims 17-21, 31-35, and 37-43 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 17-21 and 31-35 fail to further limit the structure of the device. Claims 16 and 30 are directed to the physical capabilities of the movable support however the first and second locations are not structural limitations positive claimed as elements of the apparatus. As such claims 17, 18, 31 and 32 fail to further limit the preceding claims that they depend upon.

As to claims 19 and 33, the "containers" are not positively claimed as elements of the invention.

As to claims 20 and 34, there is no antecedent basis in the claim for the "said container" in line 1, of the claims.

As to claims 37 and 38, there is no antecedent basis in the claim for the "said produced voltage" in line 1, of the claims.

Claim 38 appears to be method step.

In claim 39, it is unclear what element the pronoun "its" in line 4 of the claim is referencing.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 10-41 are rejected under 35 U.S.C. 102(e) as being anticipated by Wiktor US 6,232,129.

Wiktor discloses a piezoelectric actuated device for acquiring and dispensing fluid samples. Transferring fluids from one container to another is one of the most common tasks performed in a typical chemical or biological laboratory. For example, various chemicals from different containers may have to be mixed together and then the mixture may have to be divided out equally or 'aliquoted' into other containers or onto microscope slides or some other substrates. Fluid samples are acquired or drawn up into the device by dipping the tip into a fluid and applying an alternating current electrical signal to the piezoelectric element. Removing the tip from the fluid and

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applying another electrical signal causes drops of fluid to be ejected for non-contact dispensing. The device optionally incorporates a second piezoelectric element functioning as a sensor to detect if it is empty, plugged or working properly.

FIG. 1 illustrates a piezoelectric pipette 10 with sensor, temperature control, housing and reservoir embodying the present invention. It includes an piezoelectric actuating element 12 with a glass capillary 14 bonded concentrically on the inside. The glass capillary has a nozzle 16 formed on one end by heating and then polishing the end. Applying a voltage to the piezoelectric element 12 across an inner electrode 18 and an outer electrode 20 causes it to deflect which induces an acoustic wave in the fluid filled glass capillary 14. A drop is ejected from the nozzle if the acoustic energy is high enough to overcome surface tension at the nozzle opening 22. In accordance with the present invention, a separate sensing piezoelectric ceramic tube 24 is concentric with the glass capillary 14 and adjacent to the actuating piezoelectric element 12.

In FIG. 2, the piezoelectric pipette 10b can be mounted on a supporting mounting bracket arm 32. This arm can be attached to an automated robotic instrument which dips the device into the sample fluid 28b for aspirating and then moves it to another station for dispensing. Alternatively, the piezoelectric pipette 10b with wires 33 can be attached to a manual pipettor 34 having a disposable tip 36, as shown in FIG. 3. In this case the device is dipped into the sample fluid by a human operator and then manually moved to another container or substrate for dispensing. The plunger 38 of the manual pipettor can be used for priming, rinsing and emptying the device.

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The device has been demonstrated to successfully pump fluid with excitation signal frequencies ranging from 6 KHz to 25 KHz and amplitudes from 20 V to over 90 V.

A block diagram of the dispenser actuation and sensor detection system 50 is depicted in FIG. 8. It incorporates a digital computer 52, drive electronics 54 for the actuating piezoelectric element 12, 12a, the piezoelectric pipette 10, 10a itself with an integrated sensor 24, 24a and an analog to digital converter (ADC) 56 for the sensor signal. The computer 52, upon implementing operating instructions in accordance with this embodiment of the invention forms an actuation and detection stage 58.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

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consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-9 and 42-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wiktor US 6,232,129 in view of Marquiss US 4,846,003.

Wiktor discloses a piezoelectric actuated device for acquiring and dispensing fluid samples. Fluid samples are acquired or drawn up into the device by dipping the tip into a fluid and applying an alternating current electrical signal to the piezoelectric element. Removing the tip from the fluid and applying another electrical signal causes drops of fluid to be ejected for non-contact dispensing. The device optionally incorporates a second piezoelectric element functioning as a sensor to detect if it is empty, plugged or working properly.

FIG. 1 illustrates a piezoelectric pipette 10 with sensor, temperature control, housing and reservoir embodying the present invention. It includes a piezoelectric actuating element 12 with a glass capillary 14 bonded concentrically on the inside. The glass capillary has a nozzle 16 formed on one end by heating and then polishing the end. Applying a voltage to the piezoelectric element 12 across an inner electrode 18 and an outer electrode 20 causes it to deflect which induces an acoustic wave in the fluid filled glass capillary 14. A drop is ejected from the nozzle if the acoustic energy is high enough to overcome surface tension at the nozzle opening 22. In accordance with the present invention, a separate sensing piezoelectric ceramic tube 24 is concentric with the glass capillary 14 and adjacent to the actuating piezoelectric element 12.

In FIG. 2, the piezoelectric pipette 10b can be mounted on a supporting mounting bracket arm 32. This arm can be attached to an automated robotic instrument which dips the device into the sample fluid 28b for aspirating and then moves it to another station for dispensing. Alternatively, the piezoelectric pipette 10b with wires 33 can be attached to a manual pipettor 34 having a disposable tip 36, as shown in FIG. 3. In this case the device is dipped into the sample fluid by a human operator and then manually moved to another container or substrate for dispensing. The plunger 38 of the manual pipettor can be used for priming, rinsing and emptying the device.

Wiktor does not disclose detecting when the pipette contacts a solid surface.

Marquiss discloses a measuring system for use with automated pipettes for determining the presence or absence of a pipette tip (contact with a solid surface) and when the device is submerged in a liquid. The central conduit of the pipette is connected to a source of pressure waves such as a piezoelectric transducer.

Pressure waves are introduced into a conduit by means of a hollow tube leading into a side wall of the conduit. When an open ended conduit is moved into a liquid boundary, the amplitude or wavelength or frequency or phase of the acoustic waves changes, i.e. there is a significant characteristic change in acoustic impedance, and this change may be detected with an electrical circuit. When the conduit is partially constricted, as by a tip, there is less of a change in the signal, but still a distinctive characteristic exists. Thus, the apparatus recognizes three conditions: (1) no tip attached; (2) tip attached but clear of liquid boundary; (3) tip attached and contact made with fluid boundary.

It is known that an open pipe has a natural or resonant frequency which is twice that of a closed pipe. Of course, waves introduced into the conduit are not necessarily of a resonant frequency. However, wave behavior is similar to the physics of pipes because when the conduit is closed, by contact of tip 24, with the liquid interface 17, nodes exist at opposite ends of the conduit forcing a certain vibrational mode. This vibrational mode creates a characteristic acoustic impedance which is quite different from the situation where the conduit is open. Acoustic impedance may be measured by changes in amplitude of waves within the conduit, changes in frequency, phase or measurement of the change in the quality factor, Q , of the transducer causing the vibrations. The quality factor, Q , is a measure of the loading or losses in the conduit by the excitation transducer or wave transmitter with respect to the opened or closed conduit end. Measurement of loading is a direct measurement of acoustic impedance.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Wiktor include a step that allowed for the determination of the presence of the solid disposable tip as taught by Marquiss to determine if the device is in proper working condition.

It has been established as taught by Marquiss that the presence of a solid tip and contact of a liquid boundary may be detected by means of a piezoelectric electric transducer. While appears that the solid surface reference by applicant is not intended to be a solid tip, the examiner hereby asserts that the solid tip is equivalent to a solid surface. Furthermore, the examiner asserts that the piezoelectric transducer may be

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employed to detect any type of structure that alters the resonant vibrational frequency or voltage.

The prior inventions have been directed to prevention of coming contact with solid surfaces (such as the bottom, side walls of containers). However if or when an event would occur the vibrational frequency of the piezoelectric element would obviously change, indicating such contact. It is unclear if applicant is attempting to claim a step in which the pipette is intentionally brought into contact with a solid surface. As in claim 1, it appears to be conditional, for the claim states "when said capillary contacts said solid surface." There is no positive recitation to state that the capillary is contacted with the solid surface.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Shumate et al., (2002/0116077 and ,185), Pelc et al., (2001/0016177 ; ,759) Papen, Papen et al., Hirota et al., Wiktor (2002/0150511 and ,129), Takahashi et al., Van den Engh, Gamble et al., Seubert et al., Sakai et al., Stylli et al., and Magnnussen, Jr. et. al. disclose piezoelectric pipetting devices.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian R. Gordon whose telephone number is (703) 305-0399. The examiner can normally be reached on M-F, with 2nd and 4th F off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on 703-308-4037. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

brg


Jill Warden
Supervisory Patent Examiner
Technology Center 1700